SUPPLEMENTARY INFORMATION FOR THREE-WHEEL VEHICLES

Michigan requires a separate license endorsement to operate a three-wheel vehicle. Riders must pass both a written and a skills test. The purpose of this supplement is to help prepare riders to complete the written exam for a three-wheel vehicle license or endorsement. This information is provided in addition to that offered in the first part of this Motorcycle Operator Manual, so when preparing to take the written test, begin by reading the information on two-wheel motorcycles thoroughly. It provides information on safe operation of your vehicle in traffic. This supplement contains information specific to the safe operation of a three-wheel vehicle, including both three-track vehicles and motorcycles with sidecars.

KNOW YOUR VEHICLE

Due to the many three-wheel vehicle designs available on the market today, standards suitable for testing may vary. However, vehicles should conform to standards determined by Michigan. In general, three-wheel vehicles will have the following specifications:

1. **Three wheels** leaving two or three separate tracks during straight line operation.
2. **Motorcycle-based** conversion or design with:
   - Handlebar steering
   - Motorcycle-type controls arranged with the standard layout. Convenience alterations such as a single brake pedal or lever control, automatic clutch, or automatic transmission are allowed.
   - Saddle seating
     – Seating in which the rider/passenger straddles the vehicle.
     – If designed for a passenger, the passenger must be seated behind the operator (or in a separate passenger compartment in the case of a motorcycle with sidecar).
3. **Turning** diameter of the vehicle at its widest point must be less than 40 feet.
4. **The vehicle** meets all applicable federal on-road vehicle standards.

The following vehicles are not included in this definition, and therefore testing requirements may not be applicable. Refer to the Michigan Department of State for exact regulations regarding testing for:

- **Automotive hybrids** or automotive conversions
- **Vehicles with automotive** controls or seating
- **Vehicles with front or rear mounted engines** (engines must be mounted mid-frame below the rider to be considered motorcycle-based)
- **Vehicles with enclosed** or semi-enclosed riding compartments
- **Motorcycles or scooters** with two close-set wheels in front (contact patches less than 18.1 inches apart) that lean and maneuver like standard, single-track, two-wheel motorcycles

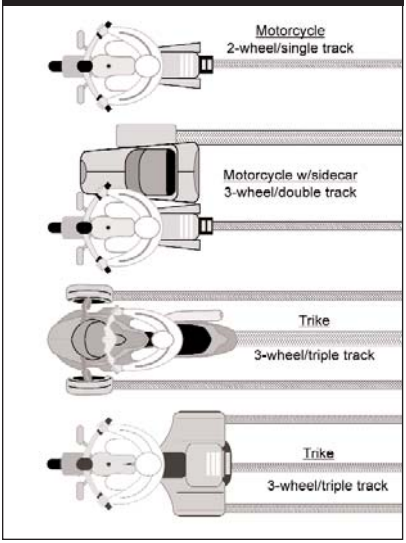
or

- **Vehicles** with any other departure from the above standards.

Three-Wheel Vehicle Designs

As shown below in the figure, vehicle designs vary among manufacturers. Unlike traditional motorcycles, which are considered single-track vehicles, three-wheel vehicles could be either dual or triple track design. Dual-track vehicles are motorcycles with sidecars, while triple track vehicles can be configured either with dual front wheels or dual rear wheels.

MOTORCYCLE AND THREE-WHEEL VEHICLE DESIGNS



The Right Vehicle for You

Make sure your three-wheel vehicle or sidecar-equipped motorcycle is right for you. You should be able to comfortably reach and operate all of the controls, and be able to complete full vehicle turns using the handlebars without excessive upper body movements that could jeopardize stability and control.

Borrowing and Lending

Borrowers and lenders, beware.

Crashes are fairly common among beginning operators, especially in the first months of riding. Operating an unfamiliar vehicle adds to the problem. If you borrow a three-wheel vehicle or motorcycle with sidecar, get familiar with it in a controlled area. If you lend your three-wheel vehicle or motorcycle with sidecar to friends, make sure they are licensed and know how to ride before you allow them to operate in traffic. Such vehicles operate very differently than two-wheel motorcycles.

No matter how experienced you may be, be extra careful on any vehicle that is unfamiliar or new to you.

Get Familiar with Vehicle Controls

Be sure you are familiar with the controls of the three-wheel vehicle or motorcycle with a sidecar before attempting to operate it on any highway, since some vehicle controls may differ from those found on other three-wheel vehicles or motorcycles. This is especially important if you are riding on a borrowed vehicle. Before beginning the ride:

- **Make all the checks** you would on your own vehicle.
- **Familiarize yourself** with all controls, such as the turn signals, horn, headlight switch, fuel control valve, and

cut-off switch. Locate and operate these items without having to search for them.

- **Operate all the controls** before you start riding. Know the gearshift pattern and operate the throttle, clutch and brakes a few times. Controls react differently on different vehicles, and exact locations of controls may vary slightly. Additionally, some motorcycle conversions may be equipped with a single brake pedal or lever control, automatic clutch, or automatic transmission.
- **As you begin to ride**, start out slowly and carefully and be aware of your surroundings. Accelerate gently, take turns a little more slowly, and leave extra room for stopping.

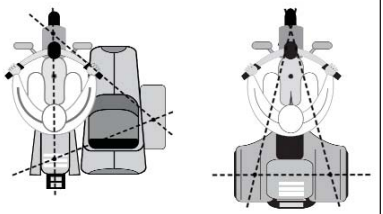
BASIC VEHICLE CONTROL

Steering and Tip

Three-wheel vehicles handle differently than motorcycles. With three wheels on the ground, they are naturally more stable than a motorcycle. They also steer differently. Because conventional three-wheel vehicles cannot lean, they cannot countersteer. Instead, the front wheel is pointed in the direction the rider wants the vehicle to go.

Under some conditions during the operation of a three-wheel vehicle, it is possible to have only two wheels in contact with the road surface. This could occur during turning or tight maneuvers whenever

TIP-OVER LINES



------Tipover Lines

enough weight is transferred outside of what are called tip-over lines. The figure shows the tip-over lines on three-wheel vehicles. Because of this tendency, careful load and passenger positioning inside the tip-over lines will help maintain maximum stability of the vehicle.

Body Position

As with any motor vehicle, operator position is important for control and for reducing or preventing fatigue. The operator should be able to reach both handgrips comfortably, since more handlebar movement is necessary than when riding a motorcycle. While it is not necessary for the rider of a three-wheel vehicle to move drastically during operation, shifting weight in the direction of the turn can improve control.

Braking

On a motorcycle with a sidecar, during braking in a sharp turn, the sidecar wheel may lift off the ground. Motorcycle and sidecar tires have limited traction or grip on the road surface and traction is greater when the vehicle is rolling, not skidding or slipping. During turning, some of the available tire

traction is used for cornering, so less is available for stopping. Thus, a skid can occur if you brake too hard.

TURNING

The tendency of the rear, inside wheel to lift during turning is greater with increased vehicle speed and tighter curve radii. During a turn, inertia causes the center of gravity of the vehicle to shift sideways, and outward toward the tip-over line. The reduced weight over the opposite side wheel can cause it to lift slightly.

Because the weight of a three-track vehicle is distributed almost equally between the two front or two rear wheels, these vehicles handle the same in left- and right-hand turns.

When turning a three-track vehicle:

- **Approach a turn** at speed with your head up, and look through the turn.
- **Concentrate** on pointing the front wheel/wheels in the direction you want the vehicle to go.
- **Roll off** the throttle before entering the turn.
- **Apply the brakes** enough to slow the vehicle to a speed at which you can ride safely through the turn, then release the brakes before the turn.
- **Slightly lean** your upper body in the direction you intend to turn.
- **Steer** the front wheel/wheels toward the turn.
- **Roll on** the throttle to pull the vehicle through the turn.

Because the center of gravity of a motorcycle with sidecar is close to the motorcycle itself, the behavior of the vehicle when turning right and when turning left are quite different.

During a right turn, a slight sideways movement of the center of gravity creates a greater tendency for the sidecar wheel to lift. The lift will be greater if the sidecar is empty or lightly loaded.

When turning right on a motorcycle with sidecar:

- **Anticipate** the degree of turn required.
- **Reduce speed** before entering the curve by downshifting or braking.
- **Slightly lean** your upper body in the direction you intend to turn.
- **Maintain speed** as you enter the curve.
- **Accelerate** gradually as you exit the curve.

During a left hand turn, the sidecar acts as a stabilizer, so the sidecar wheel stays on the ground. However, if the turn is taken too sharply or at too high a rate of speed, there is a tendency for the motorcycle rear suspension to extend, and this may cause the rear wheel of the motorcycle to lift off the ground.

When turning left on a motorcycle with sidecar:

- **Reduce speed** prior to entering the turn.
- **Apply** more pressure on the rear brake than on the front.

HILLS

When riding uphill on a three-wheel vehicle or motorcycle with a sidecar, some weight will shift to the rear, causing the front of the vehicle to become lighter. This weight shift reduces the traction on the front tire/tires for steering and tire grip.

When riding downhill, gravity increases the amount of braking force required to slow or stop the vehicle. It is important, therefore, to begin slowing earlier for cornering and stopping.

Lane Position

The track of the dual wheels of a three-wheel vehicle or motorcycle with a sidecar is almost the same width as some automobiles. Unlike a motorcycle, you are limited, therefore, in lane positioning. Keep toward the center of the lane to be sure the track of the dual wheels does not cross the painted lines into opposing traffic. Riding too far to the right could cause loss of traction if the tire leaves the pavement.

Lane positioning when riding in groups is also an important consideration. You will not be able to use a staggered formation, such as you would when riding motorcycles. Ride single file and always maintain a safe margin, two seconds minimum, between vehicles.

Parking at the Roadside

Because of the limitations on mobility and vehicle length, it is not practical to park your vehicle at a 90-degree angle with your rear wheel touching the curb, as you would with a motorcycle. Position your vehicle in a parking space so you are parked parallel to the curb and set the parking brake. Some three-wheel vehicles have reverse, so you can more easily maneuver into a parking space designed for an automobile. Parking parallel to the curb will facilitate pulling away from the curb and entering the lanes of traffic.

Acceleration and Deceleration

A three-wheel vehicle with two drive wheels tends to be much more stable during acceleration and braking than a motorcycle with a sidecar. Attaching a sidecar to your motorcycle adds a non-powered, off-centered mass of weight. So, during acceleration, the sidecar will feel as though it is lagging behind you, causing the vehicle to feel as though it is being steered to the right. During deceleration or braking, the momentum of the sidecar continues to carry it forward, giving the feeling that the sidecar is trying to pass you, making the vehicle feel as though it is being steered left.

- **On acceleration**, compensate for the tendency to swerve by steering slightly in the opposite direction from the sidecar.
- **On deceleration**, compensate for the tendency to swerve by steering slightly in the direction of the sidecar. You can also pull in the clutch when braking.

Swerving

A quick stop may not always be sufficient to avoid an obstacle in your path, even if you properly apply both brakes. Sometimes the only way to avoid a collision is to swerve. A swerve is any sudden change of direction. It can be two quick turns or a rapid shift to the side when maneuvering the vehicle. Often, there is not much time to adjust your body position.

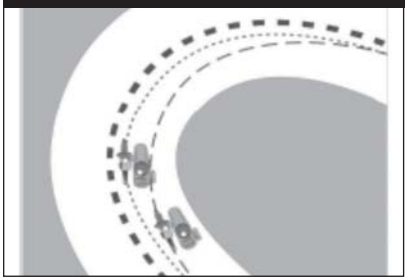
A three-wheel vehicle or motorcycle with sidecar is not as maneuverable as a motorcycle, so plan well ahead to avoid the need

for any sudden turns or swerving. If braking is required, brake either before or after the swerve, never while swerving.

Cornering and Curves

The cornering characteristics of a three-wheel vehicle or motorcycle with a sidecar differ from those of a motorcycle. Even with three wheels on the ground, a sidecar can tip over if it is being turned too sharply or is going too fast for a corner. Therefore, it is best to always slow before entering a corner.

PATH THROUGH A CURVE



The best path to follow in the curve may not be the one that follows the curve of the road. Following the center of the lane may actually increase the tip-over forces. Check opposing traffic carefully, and if safe, enter the curve toward the outside of your lane, as shown in the figure. This increases your line of sight through the curve and reduces the effective radius of the curve. As you turn, move toward the inside of the curve, and as you pass the center, move to the outside to exit, always remembering to stay in your lane.

CARRYING PASSENGERS AND CARGO

Three-wheel vehicles are designed to carry passengers and cargo, but always be sure not to exceed the tire or vehicle loading capacity. The extra weight could change the handling characteristics of the vehicle slightly, so you must give some thought to where the loads are positioned.

Many three-track vehicles will have built-in storage compartments for cargo, either in front of or behind the rider. On these vehicles, center the load and keep it low in the storage areas so it is positioned within the tip-over lines and balanced side-to-side. If a passenger is being carried, the passenger will sit directly behind the rider.

On a motorcycle with a sidecar, the best place for a passenger is in the sidecar. Never put a single passenger on the saddle; the added weight on the tip-over line will increase the instability of the vehicle. While a second passenger can be carried on the seat behind the rider, the heavier passenger should always be in the sidecar.

The passenger sitting behind the rider should sit upright at all times. It is not necessary for the passenger to lean into curves with the rider.

When carrying loads in a sidecar, secure the load firmly in place, since if the load shifts, handling will be affected. Loads should be distributed toward the rear of the sidecar to reduce tipping of the nose of the sidecar in the event of a sudden left turn.

When loaded, you may find performance is reduced and that stopping distances are longer, so allow a little extra distance. The addition of a sidecar passenger will greatly improve stability, and right hand turns can be made at a slightly higher speed. Turning left, however, will require more turning force.